theorem it will be necessary to consider one term in the formula, which will be the differential of an arc of a line of curvature; just as, by considering two conjointly, we were led to the expression for the length of a geodesic arc.

"The formula of M. Liouville, which I have employed, admits of being interpreted in several ways. For instance, analytically speaking, it gives us Abel's theorem respecting the comparison of ultra-elliptic functions of the first class and second species; and, regarded under this point of view, it furnishes us with the solution of the following problem:

"'Being given three arcs of a line of curvature on a surface of the second degree, to determine two others dependent upon them algebraically, so that the sum of the five arcs, taken with their proper signs, may be equal to a right line.'

"In conclusion, I beg to disclaim any originality in the foregoing communication. Everything which I have advanced on the subject is implicitly contained in the very elaborate memoir of my friend M. Liouville."

FEBRUARY 26TH, 1849.

REV. HUMPHREY LLOYD, D. D., PRESIDENT, in the Chair.

On the recommendation of the Council,

IT WAS RESOLVED,—That £100 be placed at the disposal of the Secretary of the Academy, for the purchase of Irish MSS. at the Stowe sale.

The President communicated some facts respecting the remarkable atmospheric wave which passed over Dublin in the course of the present month, together with a notice of the more

considerable barometric oscillations observed at Dublin since the beginning of the present century.

The greater barometric oscillations at a given place may be considered as the effects of the passage of large atmospheric waves, the direction and velocity of which can be traced by simultaneous observations made at distant stations. This view, originally propounded by Sir John Herschel, has been confirmed by Mr. Birt, who has traced with much care and skill the progress of some very remarkable waves over Europe. Much, however, yet remains to be done in connexion with this subject. It is still to be ascertained to which of the two great classes of waves (waves of *translation*, or waves of *oscillation*), the great aerial waves are to be referred; and it is far from certain, that the dynamical relation between the molecular movement and the phase of the oscillation, which holds in the known forms of waves, will explain the phenomena of the dependence of the wind upon the barometric pressure.

The chief difficulty in the way of the solution of these questions arises from the fact, that the aerial disturbance is in general the compound effect of the passage of several waves, moving in different directions, and that the phenomena are thus interwoven and complicated. It is, therefore, important, with a view to the disentanglement of their laws, that the cases at first selected for examination should be, as far as possible, free from this complexity. In this point of view, the greater barometric oscillations, in which the principal movement generally predominates over the subordinate, are especially deserving of attention; and on this account, as well as its very unusual nature, the wave of the present month seems to call for the especial consideration of meteorologists. Its complete discussion will, of course, demand the comparison of observations at several stations; meanwhile the following facts respecting it, as observed at Dublin, are given as a contribution to the history of its progress.

The barometer began to rise at Dublin on the 28th of January, and reached a small maximum on the following day. This was followed by a slight depression on the forenoon of the 30th, after which the transit of the first portion of the wave commenced,—the barometer continuing to rise (with a slight interruption) from this epoch, and reaching its maximum on the morning of February 5. The mercury then descended until the morning of February 8, when the trough dividing the two portions of the wave passed. It then began to ascend, although not continuously; and on the 10th the ascent became very rapid, the mercury rising 0·6 inch between 10 A. M. on the 10th and 10 A. M. on the 11th, when it attained the extraordinary height of 30·904 inches. The crest of the wave passed at about 11 A. M. The descent of the mercury was more gradual; it reached a relative minimum on the morning of the 13th, from which period, until the passing away of the wave, there were three minor oscillations. The posterior slope of the wave passed February 18; and after a small but abrupt rise on the afternoon of the following day, the mercury fell to 29·628 on the 20th.

The following Table, taken from the registry of the Magnetical Observatory, gives the heights of the barometer at 10 A M. and 10 P. M. during the passage of the wave. It was accompanied by a diagram.

Observations of the Barometer during the passage of the Atmospheric Wave, in February, 1849.

Date.	10 A.M.	10 P.M.	Date.	10 A.M.	10 P.M.	Date.	10 A.M.	10 P.M.
Jan. 28	29·434	——	Feb. 5	30·468	30.435	Feb. 13	30·560	30·725
29	30·087	30·058	6	·389	·330	14	·673	·556
30	29·817	·041	7	·274	·083	15	·636	·622
31	30·256	·310	8	·042	·285	16	·52$_1$	·528
Feb. 1	·180	·215	9	·353	·170	17	·64^1	·473
2	·279	·284	10	·301	·656	18	·45^4	——
3	·314	·331	11	·904	·848	19	29·87^2	·058
4	·431	——	12	·672	·517	20	·71^6	

It is a circumstance deserving of notice, that the direction of the wind continued nearly unchanged during the whole period of the transit. The wind was from between W. and SW. at the commencement, and continued between the same points (with a very brief interruption on Feb. 1) until the passage of the crest of the wave, when it shifted temporarily to the NW. (Feb. 11, 12); it then returned to W. and SW., and so continued during the remainder of the passage. There was a high gale before the commencement of the transit (Jan. 22–26); and another (Feb. 19, 21, 22) after its completion. The wind was also high, February 7–10, reaching its maximum February 9, shortly after the passage of the trough dividing the two portions of the wave. During the passage of the crest it was calm.

The barometer never attained so great a height since the regular series of meteorological observations commenced (ten years ago) at the Magnetical Observatory. In order to ascertain whether so great a pressure had been observed at an earlier period, Dr. Lloyd consulted the long and regular series of observations kept by the late Dr. Orpen, and presented by him to the Academy. It appeared from this examination that, within the last forty-five years, the barometer only once attained an equal height. This took place in January, 1825. It may not be uninteresting to meteorologists, with a view to the questions above referred to, to possess a record of the epochs of the occurrence of the greater barometric oscillations, as observed at Dublin. Accordingly the following Table has been prepared, giving the list of days from 1805 to 1848, inclusive, on which the mean daily height of the barometer exceeded 30·50 inches, together with the observed maxima. The observations from 1805 to 1838, inclusive (taken from Dr. Orpen's register), are uncorrected.

List of Days on which the mean Height of the Barometer exceeded 30·50 Inches, with the observed Maxima.

Date.	Max.	Date.	Max.
1805. Sept. 28–30, . .	30·60	1834. Dec. 10–26, . .	30·74
Nov. 13–16, . .	·70	1835. Jan. 2–6, ...	·80
1807. Jan. 1, ...	·50	Mar. 24–26, . .	·80
Feb. 28–Mar. 1,	·60	Apr. 22, 23, . .	·58
1808. Feb. 24–26, . .	·70	Dec. 22, 23, . .	.62
1816. Nov. 30, ...	·52	1836. Jan. 2, ...	·58
1817. Nov. 19, ...	·58	May 14–17, . .	·64
1818. Apr. 2, 3, ...	·53	Dec. 31–Jan. 2,	·70
Dec. 28–Jan. 1,	·75	1837. Jan. 15, ...	·54
1820. Jan. 9, ...	·67	Apr. 8, ...	·58
1821. Jan. 22, 23, . .	·57	Oct. 12–15, . .	·70
1822. Feb. 27, ...	·52	Oct. 20, 21, . .	·60
1824. Jan. 15–17, . .	·66	1838. Mar. 28, 29, . .	·60
May 26, 27, . .	·60	Oct. 2, 3, . . .	·60
1825. Jan. 5–12, . . .	·93	Dec. 8, ...	·54
Mar. 20, 21, . .	·60	1839. Jan. 23, 24, . .	·692
1826. Nov. 20, 21, . .	·58	Apr. 9–11, . . .	·690
Dec. 27, 28, . .	·56	Oct. 28, ...	·542
1827. Feb. 3–8, . . .	·65	1840. Feb. 26, ...	·598
Aug. 23, ...	·51	Mar. 2–10, . . .	·751
Dec. 28, ...	·65	Mar. 20, 21, . .	·654
1829. May 25, 26, . .	·58	Oct. 12, 13, . .	·598
Dec. 31–Jan. 3,	·67	Dec. 3, ...	·594
1830. Mar. 26, 27, . .	·53	1841. Jan. 21, ...	·562
Oct. 5, ...	·50	Feb. 24, 25, . .	·642
1831. Jan. 7, ...	·57	1842. Jan. 7, ...	·563
Mar. 31–Apr. 1,	·63	1843. Sept. 23, ...	·614
Dec. 27, 28, . .	·54	1845. Apr. 16, ...	·535
1832. Feb. 10, ...	·59	Oct. 22, ...	·553
Apr. 4, ...	·50	Dec. 12, ...	·552
May 10, ...	·56	1846. Jan. 9, ...	·567
Sept. 20, 21, . .	·58	Feb. 10, ...	·514
Nov. 6, ...	·52	Mar. 11, 12, . .	·615
1833. Jan. 3–8, . . .	·64	Sept. 12, 13, . .	·521
Jan. 23, ...	·52	Dec. 30, 31, . .	·585
July 30, ...	·55	1847. Mar. 1–4, . . .	·692
1834. Mar. 14–18, . .	·60	May 31–June 2,	·559
Apr. 3, 4, . . .	·58	Nov. 17, ...	·585
May 21–24, . .	·57	1848. Jan. 11–13, . .	·650
Oct. 26–29, . .	·64	Jan. 24, ...	·600
Nov. 14–16, . .	·64	Nov. 9–15, . . .	·667

It appears from an examination of this list that the period of maximum frequency of unusually high pressures is in January, and that of the minimum in July. This is precisely what might have been expected, the former period being that of the maximum range of the irregular oscillations, and the latter that of the minimum.

Of the barometric oscillations contained in this list there are some which deserve particular notice.

The oscillation of January, 1825, is (as has been already remarked) the most considerable; and its features resemble, in many respects, those of the wave of the present month. The barometer began to rise Dec. 27, after which the mercury executed a series of rapid oscillatory movements. On Jan. 4 it began to rise continuously, and attained the height of 30·93 on the morning of Jan. 9. The subsequent descent was gradual and regular. The entire wave occupied a period of twenty-two days in its passage. During the minor oscillations at its commencement, the wind was exceedingly variable; it settled in the NW., (January 1–4). From the 4th to the 6th, during the passage of a minor oscillation, it shifted from NW. through E. to SE.; and the movement continued in the same direction from the 6th to the 9th, during the passage of the anterior slope of the great wave, when it completed an entire gyration. From the 9th to the 11th the wind continued in the NW., and then retrograded through a quadrant to SW. during the passage of the posterior slope. It was high at the commencement and end, and calm during the passage of the crest, as in the wave of the present month.

The oscillation of March, 1840, is the next in magnitude, as respects the height attained; but is much the most considerable of any recorded in the duration of the oscillation, which embraced a period of forty-five days (February 15–April 1). Owing to this continuance of high pressure, the mean pressure for the month of March, 1840, amounted to 30·383, the highest monthly mean of which the writer was

aware. This wave was composed of seven oscillations, three at each side of the central one; and the barometric curve presented a very symmetrical character. It culminated on March 9th, when at 9 A. M. the barometer attained the height of 30·751 inches. The wind was easterly during the whole transit, but varied very irregularly between SE. and NE.

The barometric curve of March, 1847, is remarkable for its regularity, and its near approach to symmetry. The wave commenced its passage over Dublin Feb. 18, culminated March 2, and passed off March 15, its transit occupying twenty-five days. The highest pressure (March 2, 7 P. M.) was 30·692 inches. The central portion of the curve presenting a great regularity of form, and predominating greatly over the minor oscillations, this wave seems admirably suited to the examination of the relation between the molecular movement of the air and the pressure. The principal features of the phenomenon were a steady wind from SE. (Feb. 22–26), preceding the rise of the principal oscillation. This was followed (Feb. 28–March 6) by a steady wind from NE. during its transit, and (March 7–8) by a NW. wind after its passage. The oscillation is also remarkable for a retrograde movement of the wind through nearly the whole compass. The wave commenced and ended with a gale; the intensity of the wind increased also before and after the principal oscillation.

The writer concluded by some remarks upon the bearing of the facts noticed upon the theory of wave-propagation.

The following notice on the manufacture of sulphuric acid, by Professor Edmund Davy, was communicated by Professor Graves.

"My attention has been for some time directed to the consideration and examination of the different circumstances under which sulphuric acid may be formed; as by the use of the nitrates of potash or soda, and nitric acid or nitrous acid gas,